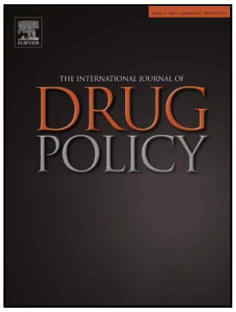

Title: Evaluating Drug Trafficking on the Tor Network: Silk Road 2, the Sequel

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Evaluating Drug Trafficking on the Tor Network: Silk Road 2, the Sequel

Highlights:

- Silk Road 2 was crawled in August and September 2014
- Of the 1,834 unique items for sale, 348 were drug items sold
- 145 distinct vendors shipped drugs from 19 countries
- The U.S. was both the number one origin and destination country for drugs
- Some vendor accounts indicated connections reaching beyond a base drug retail market

Evaluating Drug Trafficking on the Tor Network: Silk Road 2, the Sequel

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Evaluating Drug Trafficking on the Tor Network: Silk Road 2, the Sequel

Key Words:
- Drug trafficking
- Tor Network
- Silk Road 2
- Criminality

Abstract:

Background:

Housing an illicit, online drug retail market generating sales in the millions of USD, the Silk Road was a profitable marketplace with a growing and loyal consumer base. Following its FBI-forced shut down in October 2013, the Silk Road enjoyed newfound fame that contributed to an increase in new users downloading and accessing the Tor Network; however, with this particular marketplace out of order, Silk Road 2 was launched to fill the void. The goals of this study were to 1) compare the metrics of Silk Road 2 to the original site, and to 2) determine if there were any indications of the presence of more sophisticated drug trafficking operations.

Methods:

Data were collected from Silk Road 2 during the months of August and September 2014 using webcrawling software.

Results:

Silk Road 2 was a much smaller marketplace than the original Silk Road. Of the 1,834 unique items for sale, 348 were drug items sold by 145 distinct vendors shipping from 19 countries. Of the drug items advertised, most were stimulants and hallucinogens. The United States is both the number one country of origin for drug sales on Silk Road 2 and the number one destination country. Interestingly, 73% of all vendor accounts on Silk Road 2 advertised drug items, even though drugs only constituted 19% of all items advertised.

Conclusions:

This study was the first to research Silk Road 2, the replacement illicit marketplace to the original virtual Silk Road. This study was also the first to examine indications of the presence of more coordinated drug trafficking efforts in an online setting. The findings indicated that while Silk Road 2 was not primarily a drug market, there were indications that some vendor accounts may have connections reaching beyond a base retail market.

The virtual Silk Road captured the attention of the world after receiving international press following its take down by the Federal Bureau of Investigation (FBI) in October 2013 (Grossman and Newton-Small, 2013; Sandvik, 2013). An online marketplace housed on a virtual private network (VPN), the Silk Road was a hub for the online drug retail market with one scholar likening it to simply an online “drug store” (Christin, 2012: 8). Even though the majority of goods for sale were drug-related, the Silk Road offered a variety of illicit goods and services available through site listings and message board discussions, to include counterfeit passports and currency, murder for hire, and digital products (Barratt, Ferris, and Winstock, 2014; van Buskirk, Roxburgh, Bruno, and Burns, 2013; Christin, 2012; FBI, 2013; Grossman and Newton-Small, 2013; Van Hout and Bingham, 2014; 2013a; 2013b).

The Silk Road website was housed on one particular VPN, the Tor Network. In 2010, the U.S. military developed the Tor Network (previously an acronym for “The Onion Router”) as a way of providing secure and anonymous Internet access to millions of people around the world and is only accessible once the free Tor software has been downloaded and installed on the user’s computer. This software ensures Tor users’ identities and online behaviors are kept anonymous, untraceable, and unidentifiable from observers and from each other through a series of nodal relays (Christin, 2012). The Tor Network has since evolved into an expansive online hotspot to locate and purchase both legal and illegal goods and services through websites like the Silk Road that provide these hidden amenities. To access the Silk Road and others like it, the user must know the specific URL, which is “based on the pseudo-top level domain *.onion* that can only be resolved through Tor” (Christin, 2012: 3).

These added levels of anonymity and security have enticed an increasing number of customers and vendors to download Tor, with historical usage hovering around just under 1 million directly connected users daily (Tor Project, 2014). By comparison, the Silk Road had an estimated 900,000 registered users that bought and sold illicit products (Flitter, 2013) – a significant portion (if not close to the total portion) of overall Tor users. However, once the global community became more broadly aware of the Silk Road through media reports following the FBI shut down in early October 2013, this contributed to the number of daily directly connected Tor users spiking to around 5.5 million in October through early November 2013; following this initial peak in curiosity, the number of daily directly connected users has reverted to an average of roughly 2.5 million (Tor Project, 2014). This trend is evidenced in Figure 1 below. It remains to be seen, however, what percentage of the 2.5 million current Tor users are actively participating in new iterations of the Silk Road and similar illicit online marketplaces (e.g., Evolution); if history is any indication, the percentage is expected to be quite large.

[INSERT FIGURE 1 HERE]

Indeed, academics, governments, and law enforcement entities around the world have struggled to address the growing participation in drug trafficking and sales on VPNs such as the Tor Network. These online retail drug markets are relatively lucrative; according the to FBI, the Silk Road website generated sales of more than 80 million USD over two years (Aldridge and Decary-Hetu, 2014; Christin, 2014). This dollar amount is insignificant when compared to, for instance, the estimated yearly market value for cocaine in North America alone, which is over 38 billion USD (UNODC, 2010). Regardless, the Silk Road was a profitable marketplace that had a growing, loyal consumer base that identified themselves as “drug connoisseurs” in search of high quality products with low risks of detection by law enforcement (Martin, 2014b; Van Hout and Bingham, 2014; 2013a). Upon the website’s termination, individuals stepped in to create a new Silk Road (creatively named “Silk Road 2”), as well as a myriad of other drug-related marketplaces, to relieve the demand from former Silk Road customers (e.g., Agora, Pandora, Evolution, the Cannabis Road). Without doubt, the international media attention of the Silk Road take-down inspired copycat opportunists willing to fill the void left by the now-famous website.

These copycat opportunists captured not only the attention of new consumers joining this VPN, however; this escalation of Tor marketplace activity piqued the attention law enforcement officials around the world. On November 5th, 2014 the FBI, together with U.S. Drug Enforcement Administration (DEA), Homeland Security Investigations (HSI), and European law enforcement agencies acting through Europol and Eurojust, shut down Silk Road 2, seizing the site's servers and arresting the site's 26-year-old alleged operator, Blake Benthall. "Silk Road 2.0, launched in November 2013…, has enabled… people to buy and sell illegal drugs anonymously over the Internet" (FBI, 2014a: 1). However, pursuant to U.S. federal forfeiture laws, the arrest of Benthall led law enforcement agencies from the U.S. and approximately 16 foreign nations to further seize servers hosting over 400 *.onion* sites, including "dozens" of Tor marketplaces (FBI, 2014b). The sites taken down by law enforcement, including Pandora, Blue Sky, Hydra, Cloud Nine, and Executive Outcomes, are further evidence of the newfound popularity of buying and selling licit and illicit goods via this VPN.

This study was the first conducted on the newest iteration of the Silk Road, extending the work of Christin (2012) and others (Aldridge and Decary-Hetu, 2014; Barratt, Ferris, and Winstock, 2014; Martin, 2014b; van Buskirk et al, 2013; van Hout and Bingham, 2014; 2013a; 2013b). The main goals of the study were to compare the metrics of Silk Road 2 to the original Silk Road site (Aldridge and Decary-Hetu, 2014; Christin, 2012), and to conduct a preliminary investigation as to whether any indications of the presence of more sophisticated drug trafficking operations existed. This was accomplished by more closely analyzing the types and quantities of drugs sold in terms of U.S. federal guidelines (DEA, 2014a), in addition to studying known geographic and behavioral drug-related markers. More specifically, data from the Silk Road 2 was collected during the months of August and September 2014 using webcrawling software. The collection methodologies employed were closely related to those used by Christin (2012) and characterized items for sale into categories including types of drugs being sold, quantities, locations of the sellers, price, methods of payment, and options for shipping (e.g., “stealth”).

This article takes the following course; following a review of the literature regarding the original Silk Road, the methodology and data are discussed. Next, a detailed analysis of the comparison between the findings from Silk Road (Christin, 2012) and Silk Road 2 are presented and considered, followed by a discussion of potential drug trafficking indicators uncovered on Silk Road 2. Finally, implications for policy and law enforcement conclude this article.

Past Evidence of Drug Sales and Trafficking on the Silk Road

To-date, the original Silk Road has been the only illicit online narcotics marketplace on the Tor Network to be studied in detail by researchers. This is most likely an artifact of its popularity before the FBI takedown and general knowledge of its existence, with many bloggers, discussion board participants, and others utilizing online forums housed on the open Internet discussing it and its location on the Tor Network freely. Additionally, past studies of drug trafficking and sales on the Silk Road have been qualitative in nature, using interview methods to probe small numbers of respondents about their use of the online marketplace (van Hout and Bingham, 2013a; 2013b) and to document vendor experiences of selling drugs through the retail infrastructure (van Hout and Bingham, 2014). While not generalizable, the findings were useful in identifying important characteristics of both Silk Road consumers and sellers.

For instance, such assessments of Silk Road users demonstrated the majority were male, and identified their main motives for using the Silk Road to purchase drugs to include anonymity, variety in available products, and ease of stealth delivery (Van Hout and Bingham, 2013a; 2013b). These self-identified "drug connoisseurs" also enjoyed the dispute resolution transaction system and feedback ratings for various vendors, which allowed them to make more informed drug purchasing decisions. In one case study, a participant acknowledged that purchasing illicit drugs via the Silk Road provided a perceived lower risk of law enforcement detection and intervention than dealing with traditional street vendors (Van Hout and Bingham, 2013b).

From the vendors' perspective, Van Hout and Bingham (2014) used a holistic case study (with embedded units) approach to explore the experiences of Silk Road vendors. These vendors were contacted and asked to complete an online survey inquiring about demographics, prior experiences of drug dealing, motives, and their consumer base. While their study only yielded 10 responding participants, all emphasized their interest in the "intelligent and responsible" consumption of drugs, the importance of providing high quality products, and appreciation for the security measures provided by the anonymizing features of the Tor Network.

A handful of studies have taken a more comprehensive approach to studying drug-related activity on Silk Road. With a particular focus on drugs purchased via the Silk Road destined for Australia, van Buskirk and colleagues (2013) provided an analysis of trends over time regarding Australian-based Silk Road vendors. Data were collected between mid-September 2012 and early February 2013, revealing that the number of total Silk Road retailers selling to Australian-based individuals significantly increased over the sampling period (increasing from 282 retailers to 374 - a 32% increase). The number of domestic retailers housed in Australia also increased from 36 retailers to 44 (representing a 22% increase). This study indicated an increased popularity of the Silk Road in Australia, both from consumption and supply perspectives.

The only study to provide an international, comparative analysis of drug users on the Silk Road was published in 2014 by Barratt and colleagues. Through the use of anonymous online questionnaires conducted by the Global Drug Survey (GDS), Barratt, Ferris, and Winstock (2014) analyzed the results of 9,470 total participants who self-identified as recent online drug purchasers from either the United States, Australia, or the United Kingdom. The majority of the sample was familiar with the Silk Road, but only approximately one-quarter of participants in the U.K. and U.S. and 14% of participants in Australia reported buying drugs via the Silk Road. However, this study did not ask about familiarity or user-ship of other drug marketplaces (currently in existence at the time of Barratt and colleagues' (2014) study) housed on the Tor Network (e.g., Farmer's Market, Adamflowers) (DEA 2005; DEA 2012). This study found the three most common drugs purchased across the three countries via Silk Road to be MDMA, cannabis, and LSD (Barratt, Ferris, and Winstock, 2014).

Finally, Aldridge and Decary-Hetu (2014) and Christin (2012) conducted two of the most rigorous quantitative study to-date of the Silk Road. Using webcrawlers, Christin (2012) collected and analyzed data from the Silk Road for roughly eight months between 2011 and 2012. The comprehensive findings confirmed this online marketplace is most utilized by English-speaking countries (the author goes as far to claim "all communications on the Silk Road are in English" (Christin, 2012: 12), and even though there were (at the time of the study) approximately 220 distinct categories for sales items (totaling 24,400 separate items sold during the study), the majority of goods for sale were drug-related. The most popular item sold involved cannabis products, followed by prescription drugs and benzodiazepines. Interestingly, Christin

(2012) noted that the Silk Road appeared to “have more inventory in ‘soft drugs’ (e.g., weed, cannabis, hash, seeds) than ‘hard drugs’ (e.g., opiates); this presumably simply reflects market demand” (8). This may also further indicate that the Silk Road was mainly a lower-level retail market without much influence from major drug trafficking organizations. However, this was beyond the scope of Christin’s (2012) study.

Aldridge and Decary-Hetu (2014) used similar webcrawling techniques as Christin (2012) and crawled Silk Road in September 2013. This study confirmed the drug-related trends found by Christin (2012); Aldridge and Decary-Hetu (2014) also noted that revenues on Silk Road increased from roughly 14.4 million USD in 2012 (Christin, 2012) to 89.7 million USD in 2013, and that the number of vendors almost doubled from the point of data collection in Christin’s (2012) study to 1,084 unique vendor accounts. Interestingly, Aldridge and Decary-Hetu (2014) asserted that a large portion of drug transactions on this marketplace were “business-to-business” sales, in which low-level retailers were perhaps purchasing drugs on Silk Road to then resell (see also Martin, 2014a). The authors surmised this to be the case after observing that many of the drug amounts advertised were in quantities larger than expected for personal consumption. Aldridge and Decary-Hetu (2014) also interpreted suggestive comments made by vendors and noted discounts for bulk purchases. This adds an additional dimension to the Silk Road customer profile, illustrating that is perhaps incorrect to assume that all drug transactions on this Tor marketplace were simply made to individual consumers (Martin, 2014b). However, it still remains unclear the extent to which large drug trafficking organizations participated in these transactions or advertisements.

With guidance from past studies, this research extends the work of Christin (2012) and others (Aldridge and Decary-Hetu, 2014; Barratt, Ferris, and Winstock, 2014; Martin, 2014a;

2014b; van Buskirk et al, 2013; van Hout and Bingham, 2014; 2013a; 2013b) by analyzing the successor to Silk Road, comparing the metrics between the two sites, and gauging the level of sophistication in the drug market on Silk Road 2.

Methodology and Data

While Evolution and Agora were arguably the market leaders on the Tor Network at the time of this study, the first goal of this research was to determine how the new iteration compared to the original Silk Road in terms of the breadth and depth of items for sale, geographic scope, and vendor activity. As such, considering similar metrics for additional Tor sites was outside of the scope of the current research endeavor. Further, the Agora marketplace remained in beta testing during the period of this study, granting a limited number of users access to the site only upon invitation. Thus, Agora did not represent a completely open marketplace and would make comparisons less meaningful to an open Tor site like Silk Road. In line with the goals of this study, Silk Road 2 was the site chosen for data collection.

To capture publicly available data from Silk Road 2, HTTrack (a free, offline browser) was employed in order to obtain a mirrored copy of the website maintaining the site’s original link structure. Unlike the first Silk Road, Silk Road 2 did not have a CAPTCHA and thus did not require any additional work to capture or manipulate the site’s cookies (Chrsitin, 2012). In August 2014, daily test crawls of the website were conducted in order to adjust and enhance the configuration of the crawler to target the relevant information on the site. This was fairly time consuming as the crawler had to be pointed multiple levels deep before it was able to reach individual advertisements; simply instructing the software to mirror the site was not enough. HTTrack was instructed to only mirror HTML text and not to include images (capturing images substantially slows down the progress of the crawling software and produces unnecessary data).

On September 3^{rd}, 2014 a complete crawl of Silk Road 2 was conducted, which required approximately 7 hours and 18 minutes and produced a file size of 84.4 MB. Following the complete crawl of Silk Road 2, three days were allowed to pass to ensure the full crawl had not been noticed by website operators. That is, depending on how the Tor site was originally designed by the site's creator(s), such crawling activity could be noticed in a variety of ways. First, if the system were set up to maintain an activity log (most commonly capturing activity related to dates, times, and length of site activity when logged on by username), it might have had in place a mechanism by which to monitor or flag suspicious users. Similarly, the site might have been designed to maintain an activity log by IP address (even though Tor IP addresses are not the user's true IP address, it is still connected to the user's current session and username) and thus such crawling activity might be flagged. These scenarios often require someone to physically monitor the logs and follow up on suspicious activity, which is less likely to occur on a privately run Tor marketplace. Indeed, Silk Road 2 may not have employed any such activity logging system; however, the precautionary measures were utilized in this study nonetheless, which is consistent with past research (Christin, 2012; Kanich, Levchenko, Enright, Voelker, and Savage, 2008). During these three days there was no indication of any disruption caused by the crawls in this study; the account was still valid and the operators did not attempt to make contact to enquire about browsing activities (see also Thelwall and Stuart, 2006).

Once the Silk Road 2 data were sorted, all items required additional cleaning and coding. While Christin's (2012) team maintained the original categories of items for sale as given by the website (i.e., "weed," "drugs," "prescription," "benzos," "cannabis"), this study built on this methodology by ensuring items were coded into mutually exclusive categories; this was particularly important for drug items, because many actual drug items were not in a drug-related category on the website. Thus, all items for sale were coded into twelve categories: drugs, drug paraphernalia, weapons, books (including digital "how to" manuals), erotica, software (excluding hacking software), hardware, custom (an anonymous category in which the vendor does not identify any specific "thing" for sale, but instead lists only "custom order" and a price), counterfeit/data (includes counterfeit money, ID cards, passports, and data dumps), hacking software, tobacco and alcohol, and other (includes apparel, children's toys, and other miscellaneous items).

Once the drug items were identified, the drugs were further coded into 7 mutually exclusive categories: cannabis (excluding edibles and THC products), cannabis edibles and THC products, all other hallucinogens (excluding all cannabis products), stimulants, depressants, narcotics, and other (this code occurred very rarely and was only used in the few instances when the drug product was either unidentifiable or included multiple types of drugs). This was an essential and necessary step because many actual illicit drug items were listed under "alcohol," "books," and "apparel" categories on the website; if the data were not cleaned and coded in the matter used here, much of the data would be misspecified and not fully captured.

Results

The results presented in this section first analyzed the marketplace landscape of Silk Road 2 in comparison to the original Silk Road, describing first the overall categories and respective volume of items for sale, followed by a breakdown of types of drugs advertised and sold on the Tor site (both in terms of active advertisements and historical sales). The respective geographies of source and destination countries for these controlled substances were next analyzed; finally, this section concluded with a discussion of the vendors involved in these drug sales.

Marketplace Landscape

The first goal of this research was to compare the metrics from Christin's (2012) Silk Road study with its successor, Silk Road 2. Studying the original Silk Road, Christin (2012) identified "approximately 220 distinct categories, ranging from digital goods to various kinds of narcotics or prescription medicine" (8), yielding roughly 24,385 unique items for sale. In Table 1 below, Christin (2012: 9) provided data for the top 20 categories per number of item offered.

[INSERT TABLE 1 HERE]

Using the original categories as listed on the Silk Road website, it is hard to discern the total amount of drug items for sale compared with non-drug items. However, it is apparent that drug-related items composed the vast majority of what was for sale on this marketplace; "in other words, Silk Road [was] mostly a drug store" (Christin, 2012: 8; Aldridge and Decary-Hetu, 2014) selling largely cannabis-related items. This reflected a "soft drug" retail market, in which cannabis, hash, and seeds were more readily available than harder drugs, such as heroin, cocaine, and amphetamines.

Table 2 below displays the items for sale on Silk Road 2 by categories coded in this study (though it should be noted that Tables 1 and 2 are not directly comparable due to the lack of item coding in Christin's (2012) study). Interestingly, on first glance at Silk Road 2's website (Figure 2 below), in the left-hand panel it appears that there are at least 12,533 drug items for sale, 266 alcohol items, and 771 digital goods (among others). Indeed, the FBI (2014a) reported similar numbers following the takedown of Silk Road 2 that match closely with Figure 2, citing "over 13,000 listings for controlled substances, including, among others, 1,783 for 'Psychedelics,' 1,697 listings for 'Ecstasy,' … and 1,707 listings for 'Cannabis'" (1). However, this study discovered that these numbers reported on the Tor site were grossly inflated by the site's operators; that is, the total number of actual items for sale on this site equated to 1,834 (*much* fewer than its original namesake (24,385)). After investigating further, this study discovered that the category totals that appear on the website were incorrectly reported and significantly exaggerated; perhaps the operators wanted the site to appear to be as popular as was the original Silk Road, or they sought to reassure their customers that the site can compete with other, more currently popular Tor sites (e.g., Agora). At first glance, anyone simply visiting the site viewing the reported numbers listed or instructing webcrawling software to "pull" from the headers of the categories instead of counting each listing, the over 13,000 drug items appear legitimate. However, the findings of this study present an interesting contrast. Worthy of note is the webcrawling software program can only grab information on item listings that exist; the software cannot grab false or "dead" links. An additional explanation is that the operators were counting items that were not available to customers (i.e., either had not yet been posted or were deactivated listings); thus, only the server would have access to this information to include it in the totals, misrepresenting the total number of active listings.

[INSERT FIGURE 2 HERE]

Within the categories of 1,834 unique items found on Silk Road 2, drug items were only the third most popular category on this Tor marketplace. The "other" category (mostly containing apparel (e.g., women's purses, watches, clothing items)) consisted of the majority of sales items on Silk Road 2 (26.28%). Books (largely digital "how to" manuals) were second (20.07%), and drug items rounded out the top three categories (18.97%). Counterfeit/data was a close fourth, consisting of 17.88% of items for sale and included counterfeit money, passports, country IDs, U.S. state driver's licenses, and data dumps of stolen consumer identities and financial information.

Even more significant is the third column of Table 2, listing the total number of transactions made historically on the website by item category. While there were 220,202 total items sold on Silk Road 2 from its birth up to the date of this study, only 1% were drug-related. Historically, there were more software- and hardware-related items sold than drugs. In line with the most frequent active items, books and "other" categories comprised the majority of total transactions (roughly 29% each of the total number of transactions). This presents a very different Tor site than the original Silk Road, one that is mainly composed of miscellaneous items for sale and is far from the "drug store" that its predecessor was.

[INSERT TABLE 2 HERE]

While Silk Road 2 may not be primarily a drug marketplace, this study nonetheless sought to analyze the drugs that were being advertised to determine if patterns among drug items corresponded with the original site's drug sales. Even though Christin's (2012) study did not code the separate categories of drug items, the original categories of data in Table 1 above provide some preliminary indication of the various breakdowns between types of drugs. That is, "weed" and "cannabis" composed roughly 18% of the items for sale on the original site; "drugs" and "prescription" items constituted about 16% of total items for sale. Stimulants (including "cocaine," "MDMA," and "stimulants" categories) and narcotics (including "opioids" and "heroin" categories) *combined* accounted for only 8% of all items advertised. Comparing these numbers to Silk Road 2 (in Table 3 below), the drug-related landscape is much different. That is, stimulants (e.g., cocaine, methamphetamine) and hallucinogens (e.g., LSD, PCP) composed over half (28.16% and 25.57%, respectively) of the 348 active drug items for sale on the site. Cannabis alone only comprised 12.64% of drug items, and edibles/THC products were the fewest available drug-related items.

Stimulants also dominated the historical total number of drug transactions made on the Tor site; however, tied for second with hallucinogens was cannabis (both at roughly 21% of total drug transactions). This indicates that at one point, perhaps in the early days of Silk Road 2, cannabis was a more popular item sold than in more recent months.

[INSERT TABLE 3 HERE]

Within the active stimulant category, the most popular drug-types for sale were cocaine and MDMA (ecstasy), but also readily available in adequate quantities were Adderall, MDA, and methamphetamine. LSD, ketamine, and research chemicals (RCs) (to include 2C, DMT, NBOMe, and MXE), comprised the majority of hallucinogens for sale on Silk Road 2. Additional forms of dissociatives, to include mescaline, PCP, kratom, and K2/Spice, were also available for purchase. While the depressant category included a number of various prescription medicines, interestingly the narcotic category consisted almost entirely of heroin (black tar, Afghan brown powder, and southeast Asian white powder), though oxycontin, fentanyl, and morphine could also be purchased. These trends indicate that the majority of drugs for sale on Silk Road 2 did not match the “soft drug” trends on the original Silk Road; instead, the drugs largely constituted “hard drugs.”

Geography of Drugs on Silk Road 2

The geographic breakdowns of the source and destination countries for drugs sold on Silk Road 2 were next analyzed. Since drugs were not identified and considered separately in Christin’s (2012) study, there were not directly compatible geographic comparables; however, since the majority of items sold on Silk Road were drug-related, loose comparisons were made of where the items “shipped from” and “shipped to.” This “shipped from” category is selected by each vendor during the creation of a new “item for sale” advertisement and is a discrete choice;

in other words, vendors cannot indicate that items ship from multiple locations (though they can write comments to this extent in the body of their advertisements). This is not the case for the "shipped to" category; vendors may select discrete countries that they will ship to, or they may indicate that they ship to multiple destinations or singular regions (e.g., European Union).

Christin (2012) noted that the top four countries of origin for all items found on Silk Road were the United States (44%), undeclared (an option selected when the vendor does not wish to identify which country the items ship from) (16%), the United Kingdom (10%), and the Netherlands (6.5%). The top four destinations were worldwide (an option selected when the vendor does not wish to identify specific countries to ship to) (50%), the United States (35%), the European Union (6%), and Canada (6%). Christin (2012) further noted that his study recognized a "clear bias towards English-speaking countries, which represent[ed] almost two-thirds of all listed origins. This [was] not surprising since all communications on Silk Road [were] in English" (12).

Interestingly, even though Silk Road 2 presents a very different landscape in terms of not only total items for sale but also types of drugs most prevalent from the original Silk Road, the source and destination countries closely match Christin's (2012) findings. The percentages are, however, more diffused on Silk Road 2.

[INSERT TABLE 4 HERE]		[INSERT TABLE 5 HERE]

From the tables above, 19 countries were identified as distinct source countries for drugs (through vendors selecting the country as the country of origin, and 10 options (including singular countries, groups of select countries, and singular regions) indicated which countries or regions the vendors will ship to. The United States is both the number one country of origin for drug sales on Silk Road 2 and the number one destination country (26% and 20% respectively) (see Appendices A and B for breakdown of countries by type of drug sold). The U.S., however, did not corner the drug market quite as it had on the original Silk Road as a source and destination (44% and 35% respectively). Germany moved from 5th most popular country of origin on Silk Road to second place on Silk Road 2, representing 14% of the countries of origin for drug items (Table 4 above). Closely following Germany is the United Kingdom (13.79%) and Australia (12.93%) as source countries. In Table 5 above, following the U.S. as the leading destination country for drugs is Australia (12.07%) and the European Union (9.20%). The U.K. has maintained roughly the same percentage as a destination country from Silk Road to Silk Road 2 (about 3%). Interestingly, “undeclared” countries of origin played much less of a role on Silk Road 2 than its predecessor (8% and 16%, respectively), though “worldwide” destinations were roughly the same (about 50%).

These comparisons illustrate that while the types of drugs sold on Silk Road 2 differ greatly from Silk Road, the main source and destination countries have maintained similar patterns. It is also clear that Silk Road 2 experiences the same bias towards English-speaking countries acknowledged by Christin (2012), even though different languages (e.g., German, French, Spanish) were noted in communications and advertisements on the website.

Vendors Advertising Drugs on Silk Road 2

On the original Silk Road, Aldridge and Decary-Hetu (2014) identified 1,084 unique seller accounts in 2013 and Christin (2012) identified 1,239 in 2012 (spanning all items advertised on the site), noting that “no seller [was] selling a large inventory” (Christin, 2012: 12) and that each seller accounted for no more than roughly 1.5% of total items found on Silk Road. It should be noted that multiple people might in fact operate one unique vendor account. There is no immediate way to determine this beyond analyzing qualitative indicators found in comments either left to the vendor or made by the vendor (e.g., using "we" instead of "I"), which still may be inaccurate portrayals. By comparison, this study observed 199 unique seller accounts for all items advertised on Silk Road 2, 145 of which were drug items. In other words, 73% of all vendor accounts on Silk Road 2 were engaged in selling drug items, *even though drugs only constituted roughly 19% of all items advertised on this Tor site*. This was an unexpected finding, given that Silk Road 2 was not found to be the "drug store" that Silk Road was. Upon further inspection it was discovered that 92% of the drug vendors advertised 5 or fewer separate drug items, with no single vendor account marketing more than 17 unique drug items on Silk Road 2. By comparison, the other categories of items for sale on this Tor site were represented by fewer separate vendor accounts that sold greater quantities of items. For example, only 16 separate vendors were responsible for advertising 368 "book" items, with one vendor alone offering 179 unique non-drug items for sale. In all, 25 vendors accounted for approximately 80% of all items sold on Silk Road 2, with one vendor account in particular responsible for 17% of all items sold. These findings are extremely telling, further indicating that Silk Road 2 is a shadow of its original namesake, represented by a handful of vendors selling a variety of drug and non-drug items.

Interestingly, the majority of vendors advertising drugs on this Tor site have been members of Silk Road 2 for approximately 11 months (i.e., spanning the entirety of Silk Road 2's existence) (see Table 6 below). Further, the vendors who have been around the longest also comprised the greatest number of drug-related listings advertised and the total number of transactions made historically; vendors who have had accounts for 9 or more months comprised roughly 82% of the active listings for drug-related items. Given the timing of the Silk Road takedown and the estimated birth of Silk Road 2, this study found that many of these drug-related vendors may have been displaced by the original takedown and were seeking new outlets, remaining loyal to the namesake.

[INSERT TABLE 6]

Table 7 below investigates the geographic breakdown of the vendors selling drug items based on the country of origin. While there are 145 distinct vendor accounts advertising drugs for sale, some vendors indicated multiple countries of origin for different drug items. For instance, one drug vendor advertised three listings, each with a different country of origin. Hence, the frequency of vendors selling drugs based on the country each drug listing ships from is slightly greater than 145.

[INSERT TABLE 7]

While Table 7 is very similar to Table 4 in terms of country rankings, there are some noted differences. For instance, Table 4 indicates Germany as the second most frequent country of origin for drug items advertised; however, when geographic origins for drug items are broken down by vendors, Germany falls to fourth. This indicates that there are fewer vendors shipping drugs from Germany, but they are advertising a greater number of drug listings to be shipped from Germany proportionately. From Table 7, it is also clear that, for instance, one unique vendor account in Switzerland, India, Slovenia, and Bulgaria (respectively) is responsible for advertising multiple drug items shipping from these countries.

Indications of More Sophisticated Drug Trafficking?

Of particular interest to criminologists and law enforcement entities alike is gauging whether drug vendors on Silk Road 2 are simply opportunists and entrepreneurs, enjoying the anonymity of Tor and lower chance of law enforcement detection (Van Hout and Bingham, 2014), or whether there are any indications of more sophisticated organization in drug trafficking on this particular Tor marketplace (Europol, 2014). This question defines the second goal of this study, and was preliminarily investigated by analyzing the correspondence of the following: quantities of drugs per listing, frequency of drug listings per vendor, types of drugs for sale, and additional geographical and behavioral markers. While this study cannot identify and interview the operator(s) of each vendor account, the basic indicators used in this study provide an initial examination of levels of sophistication on Silk Road 2 for drug-related activity.

Using this multimodal approach, the drugs sold on Silk Road 2 were first coded by amount sold per listing in accordance with U.S. federal guidelines (as listed for Schedules I-V controlled substances, and did not include "any amount of all other" Scheduled drugs; DEA, 2014a). With these parameters, there were only 15 single listings for drug items (4.3% of all drug listings) that were advertised in amounts punishable under U.S. federal trafficking penalty guidelines. It should be noted that for each drug listing, the vendor could identify how many "pieces" of the drug were available for purchase. For instance, if a particular vendor was advertising the sale of 1 gram of Rifman Hash, that vendor could note that there were up to 100 "pieces" (in this case, grams) of 1 gram Hash available for purchase. However, this information was inconsistent among vendors and was unable to be accurately captured by the crawling software. As such, this study could only consider the amount of drug for purchase as advertised in the initial ad. Of the 15 drug listings, 4 were hallucinogens (Mexican root bark, 2C-H), 9 were depressants (Xanax, GHB), and 2 were narcotics (acetyl fentanyl). Only the Mexican root bark (MHRB) and 2C-H freebase were sold in kilogram units, with the remainder sold in gram or milliliter units. Four separate vendor accounts advertised the hallucinogens for sale, originating from the Czech Republic, the U.S., China, and undeclared; 5 vendor accounts advertised the 9 depressants listings, originating from Australia, India, the U.S., the U.K., and undeclared; and 2 vendor accounts were responsible for advertising the two narcotics listings, both originating from China. While only roughly 4% of the separate drug listings met federal sentencing guidelines, the findings indicate that if 15 items statically represented federally defined “large quantities,” it is highly probable that many more vendors were actively selling drugs in cumulative amounts that would, over time, place them in this category.

Indeed, the majority of vendors with multiple listings (through total transactions) likely qualified under the mandatory U.S. federal sentencing guidelines (see Table 6). However, in considering all 348 active drug-related advertisements, no vendor was responsible for having more than 17 active listings. In fact, only three vendor accounts advertised more than 10 drug items on Silk Road 2 at the time of the data capture, and only 21 vendors historically made 25 or more drug transactions each. While this appears to indicate a substantial retail market consisting of a majority of vendors in the “opportunist” category, the type of drug being sold in these greater frequencies by separate vendor accounts was further considered. Of these vendor accounts listing more than 10 drug items, one account listed cannabis items for sale (shipping from Germany to the E.U.), one account advertised hallucinogens (shipping from the U.S. to the U.S.), and the final account was selling depressants (shipping from the U.S. and U.K. to the U.S. and worldwide). Each of these three vendors made 364, 225, and 289 total transactions, respectively. Only the latter account demonstrated multiple points of origin and multiple destination countries, which could possibly be indicative of a more coordinated trafficking effort. In fact, only one other drug-related vendor account on Silk Road 2 indicated multiple points of origin (the U.S. and undeclared), providing additional support that this Tor site was a retail market composed of mainly entrepreneurial vendors.

It would be premature, however, to assume that there were no ties to more sophisticated trafficking groups or individuals on Silk Road 2 without considering more in depth the two most lucrative drugs trafficked by traditional drug trafficking organizations (DTOs) worldwide: heroin and cocaine (UNODC, 2010). On Silk Road 2, this study found 11% of stimulants advertised to be cocaine, and over 44% of narcotics advertised were heroin. Multiple forms of heroin are connected with large scale trafficking efforts and include black tar heroin from Mexico, Afghan brown powder heroin, and China White (or Asian white powder) heroin (UNODC, 2010). On this Tor site, 3 of the 20 heroin items for sale were black tar (from 2 vendors), 7 were Afghan brown powder (from 5 vendors), 4 were China White (from 3 vendors), and 5 were unidentified heroin (from 3 vendors). Interestingly, the advertisements for black tar heroin all shipped from the U.S. to either the U.S. or worldwide; this coincides with the primary market for black tar consumption. The vendor of two black tar listings noted:

> This is great tar. I'm trying a new source and they get it direct from Mexico. I've tried this stuff and its [sic] strong. Try little less than normal on first round. Very clean and very strong. It has a glassy look to it. The product is very hard and breaks like glass. I had to use a hammer to break it up.

The same vendor also noted on the second listing: "This is great tar. Glass Grade. It took me a while to get hooked up with the stuff." The second vendor of the third listing commented that the heroin for sale was acquired before the dealer "cut it for sale." These qualitative reports from the vendors indicate at least some (perhaps tangential) connection with organizations trafficking black tar heroin with potential access to a wholesale market or an upper-level retail market (i.e., access to the drugs before local dealers cut the product for retail sale).

Details from vendors selling China White and Afghan brown powder heroin were less indicative of the drugs' sources or any connection to larger trafficking groups. However, one vendor account selling an unidentified form of heroin noted that the vendor's location was New York City, while another vendor selling unidentified heroin (shipping from Australia) mentioned "This stuff has not been cut!! So make sure you know what you are doing! Direct from the importer, it arrived in our hands rock solid. No expense was spared in acquiring this product." While the latter comments do not indicate the type of heroin or its sources, overall data on this listing give academics and investigators information suggesting potential organizational connections.

The major geographic source for cocaine is the Andean Region of South America (UNODC, 2010). Indeed, the coca plant can only be grown in this 700 square mile region, with neighboring countries aiding in the processing of the plant into cocaine; the main consumption markets for the drug are the United States and Western Europe. Only one vendor account indicated any type of connections to cocaine sources within the 10 listings on Silk Road 2; this account listed their product as "pure uncut Peruvian cocaine" and noted "The picture is a 100g block broken off the brick. We grind it down with a coffee bean grinder for stealth shipping. This item will be shipped first class from the Netherlands or Germany." Interestingly, the countries of origin for almost all of the cocaine listings were the Netherlands and Germany. This particular vendor account not only indicates potential connections to larger organizations, but also denotes the presence of perhaps multiple individuals operating that particular account.

When taken together, the analyses of vendors (in terms of frequency of listings), quantity of drug per listing, types of drugs sold, and additional geographic and behavioral markers suggest that a very small percentage of vendor accounts on Silk Road 2 have some form of (tangential) connection to either more sophisticated trafficking groups or upper-level retail markets, where drugs can be acquired before they are cut and broken down into smaller, retail quantities. While it is clear that the entire drug market on this Tor site was not likely overrun with major DTOs moving product, the findings do suggest that drugs sold on Silk Road 2 were not solely sold or advertised in trivial amounts by isolated individuals. Even though Silk Road 2 has met its demise at the hands of the U.S. and European law enforcement, this trend is one that needs to be monitored closely on other Tor sites to determine whether drug trafficking will become increasingly sophisticated in these virtual marketplaces.

Discussion and Implications

This study sought to extend the work of Christin (2012) and other scholars (Aldridge and Decary-Hetu, 2014; Barratt, Ferris, and Winstock, 2014; Martin, 2014b; van Buskirk et al, 2013; van Hout and Bingham, 2014; 2013a; 2013b) by comparing the metrics of Silk Road (Christin, 2012) with Silk Road 2. This study, similar to Christin (2012), could not estimate the number of active buyers or the frequency with which item or vendor pages were viewed; further, calculating total monthly revenue was beyond the scope of this current research. Also beyond the scope of this research was further coding drugs on Silk Road 2 in terms of specific pharmaceutical drugs and performance or appearance enhancing substances, or determining the turnover rate of vendors over time. Additionally, there exist copious amounts of rich, qualitative data in the feedback dialogues and "comments" section on each vendor's page that have yet to be analyzed and would impart additional insight into the buyer-vendor relationship on this marketplace. These all provide excellent avenues for future research to investigate.

This also study recognizes that Silk Road and Silk Road 2 were two different sites operated by different individuals, thus making a direct comparison (of, say, Silk Road one year later) impossible. Nonetheless, this research compared the newest iteration of Silk Road's scope of activities with those of its original namesake (e.g., Aldridge and Decary-Hetu , 2014; Christin, 2012; van Buskirk et al., 2013; van Hout and Bingham, 2013a; 2013b). Interestingly, the findings from this study suggested Silk Road 2 to be a shadow of the original site. Active drug items for sale constituted only 19% of the total percentage of active items, ranking third behind "other" items (composed largely of counterfeit clothing and accessories) and "books" (largely digital "how to" manuals). Further, when considering the historical total number of transactions having taken place on Silk Road 2 up to the point of data collection, drugs accounted for a mere 1% of total items sold. This presents a very different marketplace landscape than its predecessor (Christin, 2012), but still indicates the continued popularity of Tor marketplaces following the takedown of the original Silk Road in October 2013.

Interestingly, among the drugs that were sold on Silk Road's sequel, stimulants and hallucinogens dominated the market, with depressants ranking a close third. Cannabis and other edible/THC products represented the fewest drug-related items for sale, a complete reversal of the drug market on the original Silk Road. Importantly, this study also found a handful of indications of connections to more sophisticated drug trafficking operations; this signifies that while Silk Road 2 may not have been the "drug store" that Silk Road once was, some vendors on the site did have ties to sources above the retail level. This is a situation that requires additional monitoring on the larger, more popular Tor marketplaces that still exist (e.g., Agora) to determine if this is a trend that will continue to grow.

The most recent seizures of Tor marketplaces by law enforcement (FBI, 2014b) underscore that these agencies worldwide are now watching cybersales on this VPN with the utmost attention. It is highly unlikely that the takedown of these sites and the seizure of the related servers will deter future operators of Tor marketplaces from creating new sites housing similar products (Silk Road 3 launched days after Silk Road 2 was shut down). However, academics, law enforcement investigators, and policymakers will continue to become more savvy with regards to these VPN sites, placing these illegal activities in the greater context of the growing presence of cybercrimes worldwide (Castronova, 2006; Mackey and Liang, 2011; Walsh, 2011). The Tor Network, a product developed, deployed, and funded by the U.S. government, will not disappear; even if the government does decide its demise, other VPNs already in existence will surely take its place. Thus, policymakers must work within the parameters of this new reality. Cybercrimes in general pose jurisdictional challenges (among many others); in response, countries such as the U.S. have taken measures to address the legality of drug activities online and to prosecute those responsible (e.g., *Consumer News*, 1999). For instance, the Ryan Haight Act of 2008 (a U.S. federal law) deemed it illegal to advertise the sale of a controlled substance online (unless the website is operated by a legitimate brick and mortar pharmacy that was registered with the DEA). This enables investigators to charge individuals federally for this separate crime without needing to seize the actual drugs, in addition to leveling charges of conspiracy and any other drug-related violations, allowing law enforcement agencies in the U.S. to address illegal virtual sales of controlled substances.

However, in addition to identifying and arresting the parties responsible, seizing the illegally advertised or sold controlled substances is a key element of international drug control efforts (DEA, 2014b; UNODC, 2014). Unlike during traditional law enforcement operations, once the operator of a site such as Silk Road 2 is arrested, few if any of the drugs are seized from the customers at that time (as would be typical in a traditional raid), because the vendors and customers are virtual and, thanks to the Tor Network, their IP addresses are not readily identifiable. VPNs do present the challenge of anonymity; yet, as Blake Benthall and Ross Ulbricht (alleged operator of the original Silk Road) discovered, the Tor Network cannot offer complete concealment. Once the servers hosting these sites are identified by law enforcement, anonymity is compromised. This involves additional steps for investigators (including international cooperation) in order to recover the controlled substances, but recent efforts have proven this to not be an insurmountable task.

Drug trafficking on Tor sites is a concerning phenomenon and as this study has shown, the markets for different types of drugs vary over time, as do the number of individuals involved. Indeed, however, the total volume of drugs and amount of profit made by sites such as Silk Road is inconsequential when compared to the estimated yearly market value or volume of traditional sales for drugs such as heroin and cocaine alone. It remains to be seen whether, with time, drug trafficking on the Tor Network will evolve into more lucrative and organized efforts distributing drugs at the wholesale level, or if drug sales will continue to be dominated by a retail market composed of isolated individuals, opportunists and entrepreneurs, enjoying the protection of a seemingly anonymous virtual network.

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Table 1. Original Silk Road*		
Top 20 Categories of Items for Sale	**# of Items**	**% Total**
Weed	3,338	13.7
Drugs	2,194	9.0
Prescription	1,784	7.3
Benzos	1,193	4.9
Books	955	3.9
Cannabis	877	3.6
Hash	820	3.4
Cocaine	630	2.6
Pills	473	1.9
Blotter (LSD)	440	1.8
Money	405	1.7
MDMA (ecstasy)	393	1.6
Erotica	385	1.6
Steroids, PEDs	376	1.5
Seeds	374	1.5
Heroin	370	1.5
DMT	343	1.4
Opioids	342	1.4
Stimulants	291	1.2
Digital goods	260	1.1

*Source: Christin (2012) pg. 9.

Table 2. Silk Road 2

Category of Item for Sale	# of Active Items	% Total Active Items	# of Total Transactions	% of Total Transactions
Other	482	26.28	63,922	29.03
Books	368	20.07	64,421	29.26
Drugs	348	18.97	2,229	1.01
Counterfeit/Data	328	17.88	58,482	26.56
Hacking	86	4.69	14,090	6.40
Custom	61	3.33	3,227	1.47
Drug Paraphernalia	38	2.07	760	0.35
Software	34	1.85	3,493	1.59
Hardware	31	1.69	2,724	1.24
Tobacco/Alcohol	29	1.58	735	0.33
Erotica	27	1.47	6,102	2.77
Weapons	2	0.11	17	0.01
Total:	1,834		220,202	

Table 3. Silk Road 2 Drug Items

Category of Drug	# of Active Drug Items	% Total Active Drug Items	# of Total Drug Transactions	% of Total Drug Transactions
Stimulants	98	28.16	623	27.95
Hallucinogens***	89	25.57	477	21.40
Depressants	51	14.66	381	17.09
Narcotics	45	12.93	192	8.61
Cannabis*	44	12.64	469	21.04
Others	12	3.45	54	2.42
Edibles/THC products**	9	2.59	33	1.48
Total	348		2,229	

* omits edibles and THC products; ** omits previous category; *** omits all cannabis, edibles, and THC products

Table 4. Frequency of Drugs for Sale on Silk Road 2 by Country of Origin

Country	Frequency	% Total
United States	92	26.44
Germany	49	14.08
United Kingdom	48	13.79
Australia	45	12.93
Netherlands	21	6.03
Canada	18	5.17
Belgium	8	2.30
China	8	2.30
Switzerland	6	1.72
Czech Republic	5	1.44
Spain	5	1.44
India	3	0.86
Slovenia	3	0.86
Bulgaria	2	0.57
Denmark	2	0.57
Finland	1	0.29
Norway	1	0.29
Slovakia	1	0.29
Sweden	1	0.29
Undeclared	*29*	8.33
Total	348	

Table 5. Frequency of Drugs for Sale on Silk Road 2 by Geographic Destination

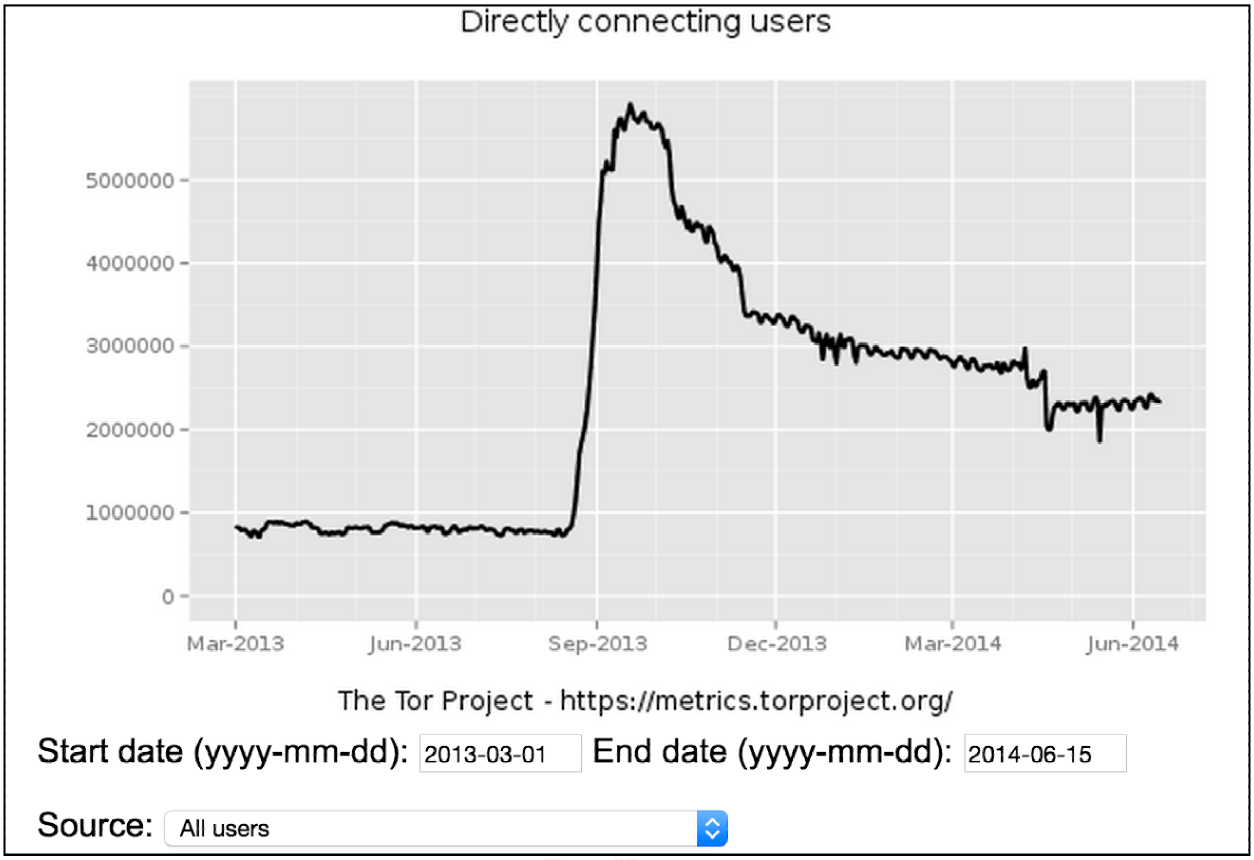
Country	Frequency	% Total
United States	70	20.11
Australia	42	12.07
European Union	32	9.20
United Kingdom	11	3.16
Worldwide except Australia	8	2.30
United States and Canada	6	1.72
Norway	1	0.29
Sweden	1	0.29
Undeclared	*2*	0.57
Worldwide	*175*	50.29
Total	348	

Table 6. Drug Items sold by Vendors on Silk Road 2 by Duration of Membership

Months of Membership	# of Vendor Accounts	# of Active Listings	# of Total Transactions
11	69	168	1,059
10	34	80	425
9	17	39	195
8	7	12	28
5	2	3	5
6	1	5	60
7	1	1	1
Blank	*14*	*40*	456
Total	145	348	2,229

Table 7. Frequency of Vendors Selling Drugs on Silk Road 2 by Country of Origin

Country	Frequency	% Total
United States	37	24.50
United Kingdom	25	16.56
Australia	19	12.58
Germany	15	9.93
Canada	10	6.62
Netherlands	7	4.64
Belgium	5	3.31
China	4	2.65
Spain	3	1.99
Czech Republic	2	1.32
Denmark	2	1.32
Switzerland	1	0.66
India	1	0.66
Slovenia	1	0.66
Bulgaria	1	0.66
Finland	1	0.66
Norway	1	0.66
Slovakia	1	0.66
Sweden	1	0.66
Undeclared	*14*	9.27
Total	151	



Directly connecting users

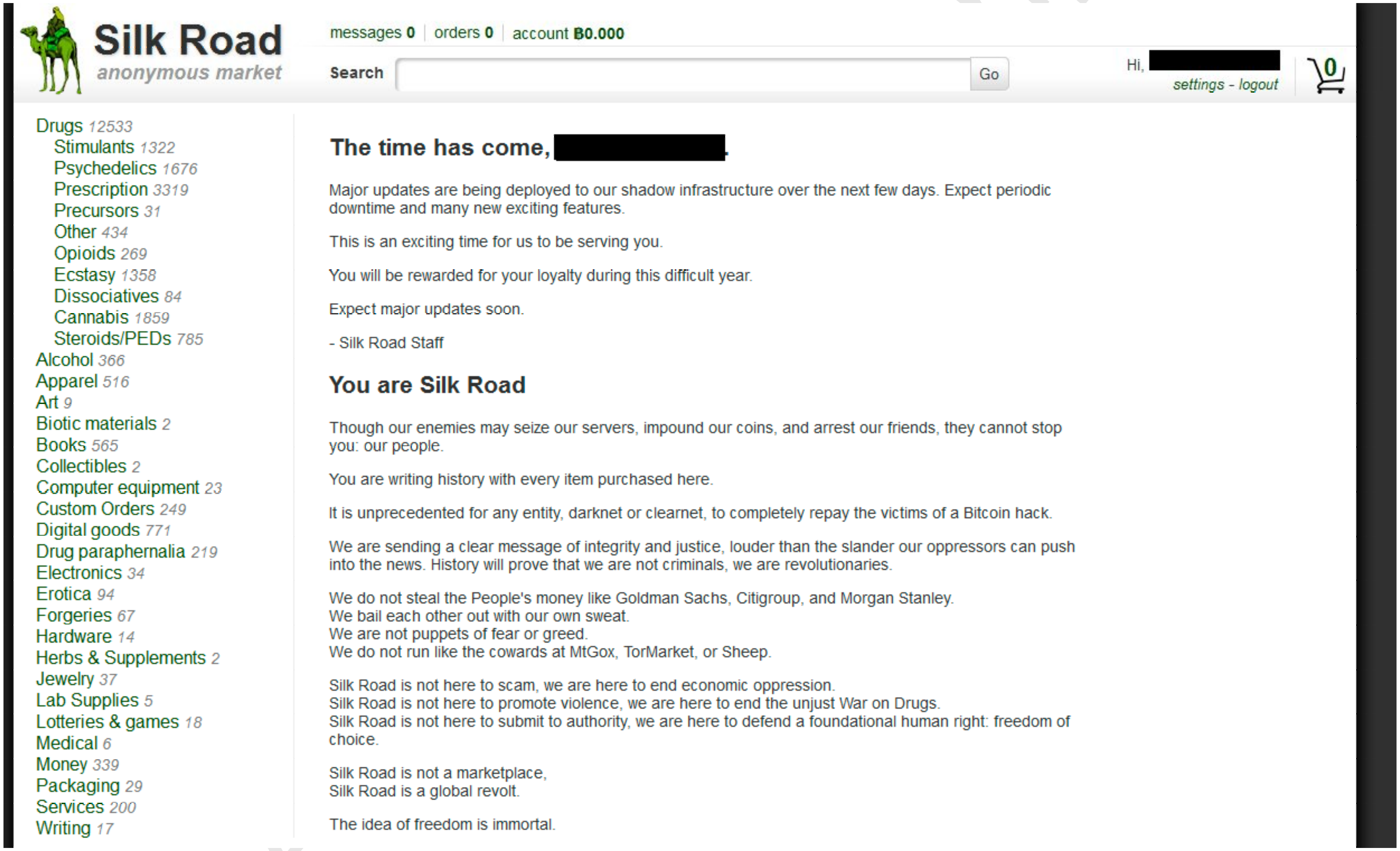
The Tor Project - https://metrics.torproject.org/

Start date (yyyy-mm-dd): 2013-03-01 End date (yyyy-mm-dd): 2014-06-15

Source: All users

Figure 1. The Estimated Number of Directly Connecting Users on the Tor Network from March 1st, 2013 to June 15th, 2014 Provided by TorProject.Org
Note: this figure can be resized as wished to fit the journal's needs.

Accepted



The time has come, [redacted].

Major updates are being deployed to our shadow infrastructure over the next few days. Expect periodic downtime and many new exciting features.

This is an exciting time for us to be serving you.

You will be rewarded for your loyalty during this difficult year.

Expect major updates soon.

- Silk Road Staff

You are Silk Road

Though our enemies may seize our servers, impound our coins, and arrest our friends, they cannot stop you: our people.

You are writing history with every item purchased here.

It is unprecedented for any entity, darknet or clearnet, to completely repay the victims of a Bitcoin hack.

We are sending a clear message of integrity and justice, louder than the slander our oppressors can push into the news. History will prove that we are not criminals, we are revolutionaries.

We do not steal the People's money like Goldman Sachs, Citigroup, and Morgan Stanley.
We bail each other out with our own sweat.
We are not puppets of fear or greed.
We do not run like the cowards at MtGox, TorMarket, or Sheep.

Silk Road is not here to scam, we are here to end economic oppression.
Silk Road is not here to promote violence, we are here to end the unjust War on Drugs.
Silk Road is not here to submit to authority, we are here to defend a foundational human right: freedom of choice.

Silk Road is not a marketplace,
Silk Road is a global revolt.

The idea of freedom is immortal.

Figure 2. Silk Road 2 Screenshot from September 3rd, 2014
Note: this figure is intended for color reproduction on the Web and in print. It can be resized to be smaller in order to fit with the scale desired by the journal.

Appendix A. Frequency of Drugs for Sale on Silk Road 2 by Country of Origin and Type of Drug

Country by Rank	**Cannabis***	**Edibles/THC Products****	**Hallucinogens*****	**Stimulants**	**Depressants**	**Narcotics**	**Other**	**Total**
1. United States	7	6	23	21	18	14	3	**92**
2. Germany	17	0	11	18	1	2	0	**49**
3. U.K.	3	0	17	7	11	8	2	**48**
4. Australia	1	0	14	19	6	3	2	**45**
5. Netherlands	8	0	2	10	0	1	0	**21**
6. Canada	1	0	3	9	2	3	0	**18**
7. Belgium	1	0	2	3	0	2	0	**8**
8. China	0	0	2	0	0	6	0	**8**
9. Switzerland	3	0	0	3	0	0	0	**6**
10. Czech Republic	0	0	3	1	1	0	0	**5**
11. Spain	1	0	3	0	1	0	0	**5**
12. India	0	0	0	2	0	0	1	**3**
13. Slovenia	0	0	0	0	3	0	0	**3**
14. Bulgaria	0	0	1	0	0	1	0	**2**
15. Denmark	0	0	0	0	1	0	1	**2**
16. Finland	0	1	0	0	0	0	0	**1**
17. Norway	0	1	0	0	0	0	0	**1**
18. Slovakia	0	0	0	0	1	0	0	**1**
19. Sweden	0	1	0	0	0	0	0	**1**
Undeclared	*2*	0	8	5	6	5	3	***29***
Total	**44**	**9**	**89**	**98**	**51**	**45**	**12**	**348**

Note: *omits edibles and THC products; **omits cannabis; *** omits all cannabis, edibles, and THC products

Appendix B. Frequency of Drugs for Sale on Silk Road 2 by Geographic Destination and Type of Drug

Country by Rank	Cannabis*	Edibles/THC Products**	Hallucinogens***	Stimulants	Depressants	Narcotics	Other	Total
1. United States	6	1	13	21	17	9	3	**70**
2. Australia	1	0	12	19	5	3	2	**42**
3. European Union	15	0	2	5	4	5	1	**32**
4. United Kingdom	1	0	2	1	2	5	0	**11**
5. Worldwide except Australia	0	0	3	4	0	1	0	**8**
6. U.S. and Canada	0	1	0	3	0	2	0	**6**
7. Norway	0	1	0	0	0	0	0	**1**
8. Sweden	0	1	0	0	0	0	0	**1**
Undeclared	0	0	2	0	0	0	0	**2**
Worldwide	21	5	55	45	23	20	6	**175**
Total	44	9	89	98	51	45	12	**348**

Note: *omits edibles and THC products; **omits cannabis; *** omits all cannabis, edibles, and THC products